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Description

GELLED ACID

BACKGROUND OF INVENTION

[0001] The invention relates to stimulation of production in hydrocarbon wells. More specifically it relates to gelled acids for diversion and leakoff control in matrix acidizing and acid fracturing. Most specifically it relates to reducing agents and reducing agent precursors that are less toxic to aquatic species and that leave less residue than prior reducing agents upon destruction of the crosslinking agent after treatment.

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Charles Richard
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1/30/06

[0002] Acids are often used to treat subterranean formations to stimulate the formations to increase the production of fluids, such as hydrocarbons. When the acid is injected above the fracture pressure of the formation being treated, the treatment is called acid fracturing or fracture acidizing. The object is to create a large fracture that serves as an improved flowpath through the rock formation. After such fractures are created, when pumping of the fracture fluid is stopped and the injection pressure

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[002] Acids are often used to treat subterranean formations to stimulate the formations to increase the production of fluids, such as hydrocarbons. When the acid is injected above the fracture pressure of the formation being treated, the treatment is called acid fracturing or fracture acidizing. The object is to create a large fracture that serves as an improved flowpath through the rock formation. After such fractures are created, when pumping of the fracture fluid is stopped and the injection pressure drops, the fracture tends to close upon itself and little or no new flow path is left open after the treatment. Commonly, a proppant is added to the fracturing fluid so that, when the fracture closes, proppant remains in the fracture, holds the fracture faces apart, and leaves a flowpath conductive to fluids. Alternatively, instead of propping, if the formation rock is acid soluble, for example is a carbonate, an acid may be used as a component of the fracturing fluid. The acid differentially etches the faces of the fracture, creating or exaggerating asperities, so that, when the fracture closes, the opposing faces no longer match up. Consequently they leave an open pathway for fluid flow. A problem with this technique is that as the acid is injected it tends to react with the most reactive rock and/or the rock with which it first comes into contact. Thus, much of the acid is used up near the wellbore and is not available for etching of the fracture faces farther from the wellbore. Furthermore, the acidic fluid follows the paths of least resistance, which are for example either natural fractures in the rock or areas of more permeable or more acid-soluble rock. This process creates typically long branched passageways in the fracture faces leading away from the fracture, usually near the wellbore. These highly conductive microchannels are called "wormholes" and are very deleterious because subsequently-injected fracturing fluid tends to leak off into the wormholes rather than lengthening the desired fracture. To block the wormholes, techniques called "leakoff control" techniques have been developed. This blockage should be temporary, because the

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